

SET NOTATION

(3-5 Marks)

(Symbols)

: Such that

$n(A)$ = Number of element in set A .

$\mathcal{U}$ = Universal Set (It is universe for this Question)

A' = A complement (Everything in universe except for A)

$\cup$ = Union (Combine both sets) (ignore repeats)

$\cap$ = Intersection (Common elements in both sets)

$\emptyset$ = Empty Set (Nullset) $\rightarrow \emptyset = \{ \}$
 Φ

$\in$ = Belongs to

$\notin$ = Does not belong to

$\subseteq$ = Subset

$\not\subseteq$ = Not a subset

(SETS)

Define: Set is a group of **unique** elements

↓
You cannot repeat anything
inside set.

$$A = \{ x : x \text{ is each day name's first alphabet} \}$$

↓
such that

$$A = \{ M, T, W, F, S \}$$

$$n(A) = 5$$

$$B = \{ x : x \text{ is number of days in a month} \}$$

$$B = \{ 31, 28, 29, 30 \}$$

$$n(B) = 4$$

$$C = \{ x : x \text{ is an odd number} \}$$

$$C = \{ 1, 3, 5, 7, 9, \dots \}$$

TYPE 1: LISTING.

Q: $\mathcal{U} = \{x : 1 \leq x < 12 \text{ and } x \text{ is integer}\}$

Universal
set
(This is universe
for this question)

$$\mathcal{U} = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11\} \quad n(\mathcal{U}) = 11$$

$$A = \{x : x \text{ is odd number}\}$$

$$A = \{1, 3, 5, 7, 9, 11\} \quad n(A) = 6$$

$$A' = \{2, 4, 6, 8, 10\} \quad n(A') = 5$$

$$B = \{x : x \text{ is a factor of } 12\}$$

$$B = \{1, 2, 3, 4, 6\} \quad n(B) = 5$$

$$B' = \{5, 7, 8, 9, 10, 11\} \quad n(B') = 6$$

$$C = \{x : x \text{ is a prime numbers}\}$$

$$C = \{2, 3, 5, 7, 11\} \quad n(C) = 5$$

$$C' = \{1, 4, 6, 8, 9, 10\} \quad n(C') = 6$$

$$D = \{x : x \text{ is a multiple of } 4\}$$

$$D = \{4, 8\} \quad n(D) = 2$$

$$D' = \{1, 2, 3, 5, 6, 7, 9, 10, 11\} \quad n(D') = 9$$

List elements of:

$$(a) \underset{\substack{\downarrow \\ \text{combine}}}{A \cup B} = \{1, 2, 3, 4, 5, 6, 7, 9, 11\} \quad n(A \cup B) = 9$$

$$(b) \underset{\substack{\downarrow \\ \text{common}}}{A' \cap C} = \{2\} \quad n(A' \cap C) = 1$$

$$(c) \underset{\substack{\downarrow \\ \text{common}}}{B' \cap D'} = \{5, 7, 9, 10, 11\} \quad n(B' \cap D') = 5$$

$$(d) \underset{\substack{\downarrow \\ \text{combine}}}{C \cup B'} = \{2, 3, 5, 7, 8, 9, 10, 11\} \quad n(C \cup B') = 8$$

$$(e) \underset{\substack{\downarrow \\ \text{common}}}{A \cap D} = \emptyset \quad n(A \cap D) = 0$$

$$A = \{1, 2, 3, 4, 5\} \quad B = \{1, 3, 5\}$$

$$\underset{\substack{\downarrow \\ \text{Belongs to}}}{4 \in A} \quad (\text{True})$$

$$\underset{\substack{\downarrow \\ \text{Does not belong to}}}{4 \notin B} \quad (\text{True})$$

$$A = \{1, 2, 3, 4, 5\} \quad B = \{1, 3, 5\}$$

If all elements of B also belong to A,

B is a subset of A

$$B \subseteq A$$

TYPE 1 QUESTIONS : LISTING

Exam Tip: List all sets with their compliments first.

5

(b) $\mathcal{E} = \{x : x \text{ is an integer and } 1 \leq x \leq 8\}$. $\mathcal{E} = \{1, 2, 3, 4, 5, 6, 7, 8\}$

$P = \{x : x > 5\}$. $P = \{6, 7, 8\}$ $P' = \{1, 2, 3, 4, 5\}$

$Q = \{x : x \leq 3\}$. $Q = \{1, 2, 3\}$ $Q' = \{4, 5, 6, 7, 8\}$

(i) Find the value of $n(P \cup Q)$. $P \cup Q = \{1, 2, 3, 6, 7, 8\} \Rightarrow n(P \cup Q) = 6$

(ii) List the elements of $P' \cap Q'$.

$\{4, 5\}$

Answer (b)(i)6.....[1]

(ii) $\{4, 5\}$ [1]

8 (a) $\mathcal{E} = \{1, 2, 3, 4, 5\}$,

$A = \{1, 2, 3\}$, $A' = \{4, 5\}$

$B = \{5\}$, $B' = \{1, 2, 3, 4\}$

$C = \{3, 4\}$. $C' = \{1, 2, 5\}$

List the elements of

(i) $A \cup C = \{1, 2, 3, 4\}$

Answer (a)(i)[1]

(ii) $B' \cap C' = \{1, 2\}$

Answer (a)(ii){1, 2}.....[1]

$1, 2, 3, 4, \dots$
 $0, 1, 2, 3, 4, \dots$
 $\dots -3, -2, -1, 0, 1, 2, 3, 4, \dots$

Natural
 Whole
 Integers

} No Decimal
 or
 fraction.

16

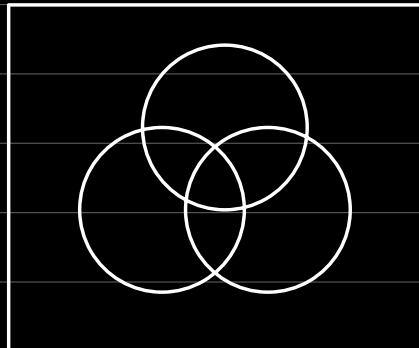
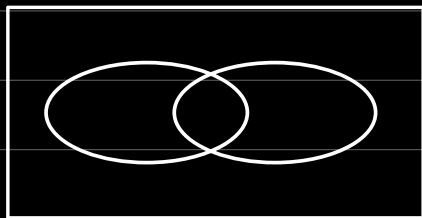
- (b) $\mathcal{E} = \{\text{natural numbers}\}$
 $P = \{\text{factors of 8}\}$
 $Q = \{\text{factors of 12}\}$

List the elements of the set $P \cup Q$.

Answer[2]

VENN DIAGRAMS
SHADING

SCENARIOS



SHADING VENN DIAGRAMS

INTERSECTION

$\cap$

$\cap$ = AND
(compulsory condition)

Step1: write **IN** and **OUT**
conditions on sets

Step2: SHADE ONLY THOSE
REGIONS WHICH
SATISFY ALL
CONDITIONS AT
SAME TIME.

UNION

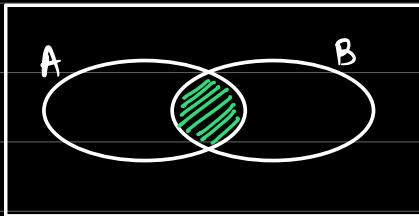
$\cup$

$\cup$ = ADD

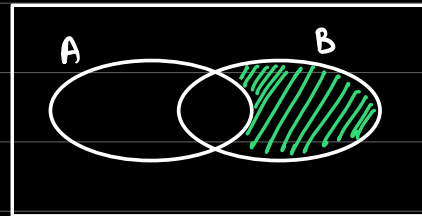
1] NO Compliment with union:
SHADE FIRST SET AND THEN
ADD SECOND SET TO IT

2] ONE COMPLIMENT SIGN with UNION
SHADE SET WITH COMPLIMENT FIRST
THEN ADD SECOND SET TO IT.

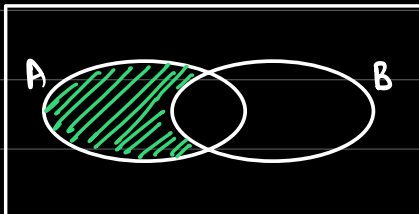
3] BOTH COMPLIMENT SIGNS WITH UNION
TAKE COMPLIMENT COMMON
FLIP MIDDLE SIGN.



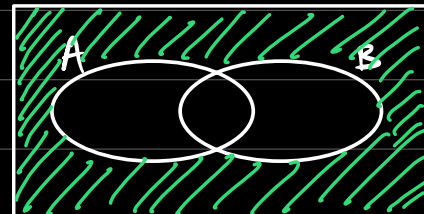
$A \cap B$
in **AND** in



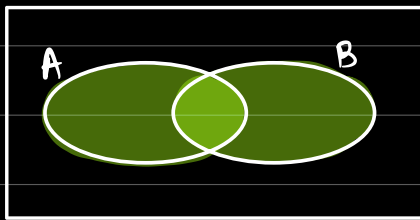
$A' \cap B$
out **AND** in



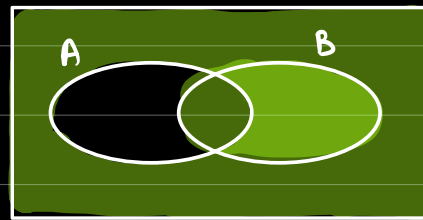
$A \cap B'$
in **AND** out



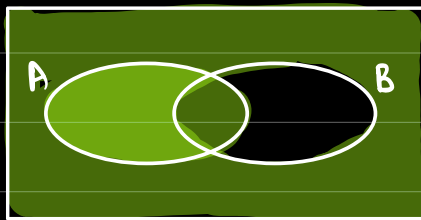
$A' \cap B'$
out **AND** out



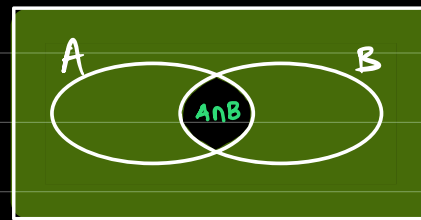
$A \cup B$
[ADD]



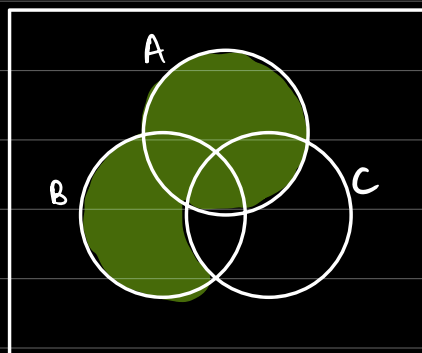
$A' \cup B$
First [ADD]



$A \cup B'$
[ADD] Color this first

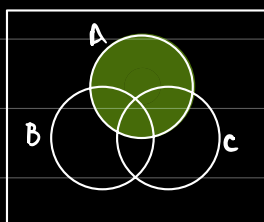


$A' \cup B'$
 $(A \cap B)'$
in AND in



$A \cup (B \cap C')$

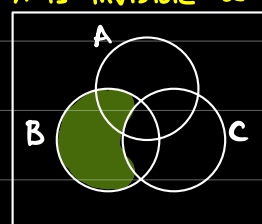
A

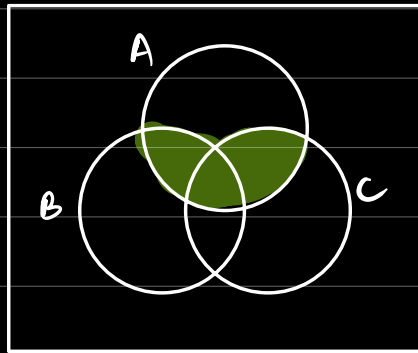


$\cup$

combine.

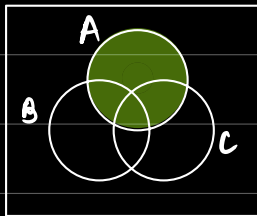
$B \cap C'$
in AND out
A is invisible to us.



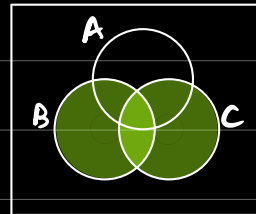


$$A \cap (B \cup C)$$

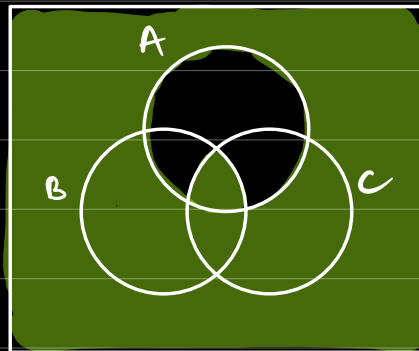
A



$B \cup C$
ADD

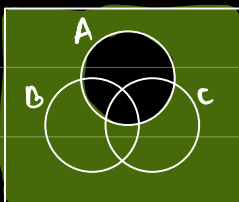


$\cap$
(common)



$$A' \cup (B \cap C)$$

A'

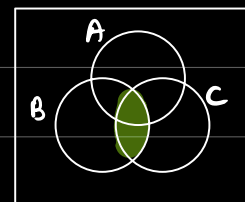


$\cup$

Combine

$B \cap C$

in AND in
A is invisible rn.



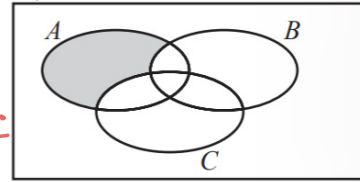
- 1 (a) Express in set notation, as simply as possible, the subset shaded in the Venn diagram.

Since this is only one region,
union will not come here.

in A AND out B AND out C

$$A \cap B' \cap C'$$

$$A \cap (B \cup C)'$$
 Answer (a) $A \cap B' \cap C'$ [1]

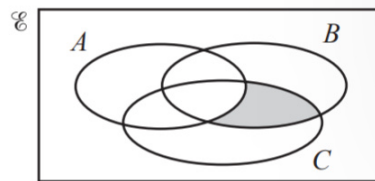


- 6 (a) Express, in set notation, as simply as possible, the subset shaded in the Venn diagram.

in B AND in C AND out A

$$B \cap C \cap A'$$

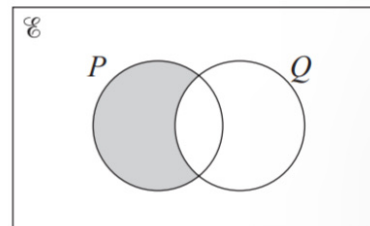
$$B \cap C \cap A'$$
 Answer (a) [1]



- (b) Express in set notation the subset shaded in the Venn diagram.

in P and out Q

$$P \cap Q'$$



$$P \cap Q'$$
 Answer (b) [1]



play both hockey and football



play neither football nor hockey



play only hockey



play Hockey.



play foot ball only



play football.

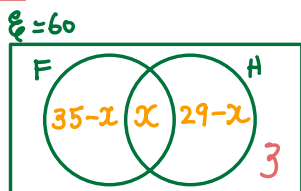
Type 3

Scenario Based

8

- (b) A group of 60 children attend an after school club.
Of these, 35 children play football and 29 play hockey.
3 children do not play either football or hockey.

By drawing a Venn diagram, or otherwise, find the number of children who play only hockey.



$$35 - x + x + 29 - x + 3 = 60$$

$$67 - x = 60$$

$$67 = x + 60$$

$$x = 7$$

only Hockey

$$29 - x$$

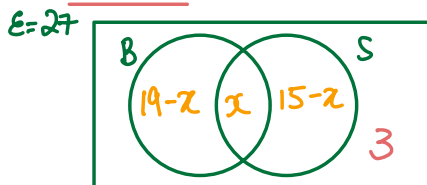
$$29 - 7$$

$$\boxed{22}$$

Answer (b) 22 [2]

7

- (b) There are 27 children in a class.
Of these children, 19 own a bicycle, 15 own a scooter and 3 own neither a bicycle nor a scooter.
Using a Venn diagram, or otherwise, find the number of children who own a bicycle but not a scooter.



$$27 = 19 - x + x + 15 - x + 3$$

$$27 = 37 - x$$

$$x = 10$$

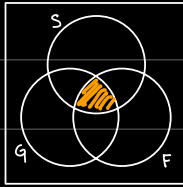
Bicycle only

$$19 - x$$

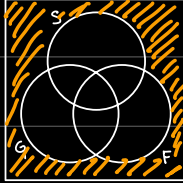
$$19 - 10$$

$$\boxed{9}$$

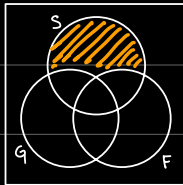
Answer (b) 9 [2]



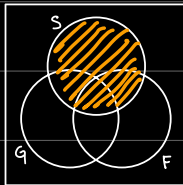
all three languages



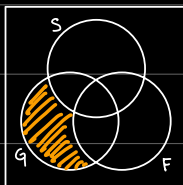
none of the three languages



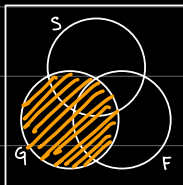
only spanish



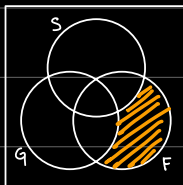
spanish



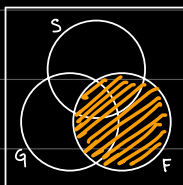
only german



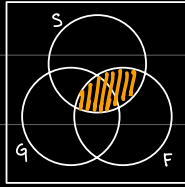
german



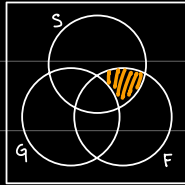
french only



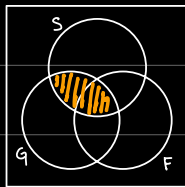
french



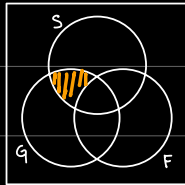
Spanish and French



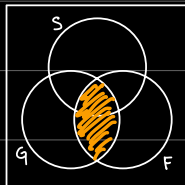
Spanish and French only
not German



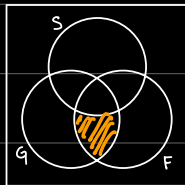
Spanish and German



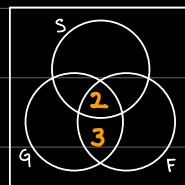
Spanish and German only.



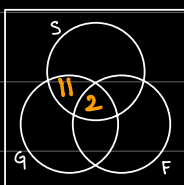
German and French



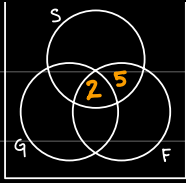
German and French only
not Spanish.



2 students study all languages.
5 students study French and German



2 students study all languages.
11 students study German and Spanish only.



2 students study all languages.

7 students study french and spanish.

